

Appendix D: Weather Related Aviation Accident Trend Update

Table D-1. Part 91, General Aviation^a

Year	Accident-Involved Aircraft				Flight Hours	Accident-Involved Aircraft per 100,000 Flight Hours			
	All	Wx All	Fatal	Wx Fatal		All	Wx All	Fatal	Wx Fatal
1994	2,022	344	404	87	22,235,000	9.09	1.55	1.82	0.39
1995	2,056	426	413	109	24,906,000	8.26	1.71	1.66	0.44
1996	1,908	442	361	109	24,881,000	7.67	1.78	1.45	0.44
1997	1,845	383	350	87	25,591,000	7.21	1.50	1.37	0.34
1998	1,904	370	364	91	25,518,000	7.46	1.45	1.43	0.36
1999	1,906	357	340	65	29,246,000	6.52	1.22	1.16	0.22
2000	1,837	356	344	85	27,838,000	6.60	1.28	1.24	0.31
2001	1,726	280	325	38	25,431,000	6.79	1.10	1.28	0.15
2002	1,713	340	345	74	25,545,000	6.71	1.33	1.35	0.29
2003									
2004									
2005									
2006									
2006 goal							0.34		0.08
2006 (proj.)		230		26		5.84	0.80	1.16	0.08

Table D-2. Part 121, Larger Commercial Air Carriers

Year	Accidents				Departures	Accidents per 100,000 Departures			
	All ^b	Wx All	Fatal ^b	Wx Fatal		All	Wx All	Fatal	Wx Fatal
1994	23	6	4	0	8,238,306	0.27	0.073	0.049	0.0000
1995	36	10	3	0	8,457,465	0.43	0.118	0.035	0.0000
1996	37	11	5	0	8,228,810	0.45	0.134	0.061	0.0000
1997	49	18	4	1	10,318,383	0.47	0.174	0.039	0.0097
1998	50	9	1	0	10,979,762	0.46	0.082	0.009	0.0000
1999	51	10	2	0	11,308,762	0.45	0.088	0.018	0.0000
2000	56	16	3	0	11,457,812	0.49	0.140	0.026	0.0000
2001	45	10	6	1	10,956,003	0.37	0.091	0.018	0.0091
2002	41	8	0	0	10,138,224	0.40	0.079	0.000	0.0000
2003									
2004									
2005									
2006									
2006 goal						0.076	0.022	0.0097	0.000
2006 (proj.)						0.37	0.044	0.00	0.002

All accident statistics from NTSB. Flight hour estimates from FAA.

^a For Part 91 sector (general aviation), the data are for numbers of accident-involved aircraft, rather than numbers of accidents.

^b For 1994, includes one accident due to an illegal act. For 2001, includes 9/11/01 terrorist acts.

Table D-3. Part 135 (Scheduled and Nonscheduled)

Year	Accidents				Flight Hours	Accidents per 100,000 Flight Hours			
	All	Wx All	Fatal	Wx Fatal		All	Wx All	Fatal	Wx Fatal
1994	95	31	29	13	5,249,129	1.81	0.59	0.55	0.25
1995	87	25	26	11	5,113,866	1.70	0.49	0.51	0.22
1996	101	29	30	8	5,976,755	1.69	0.49	0.50	0.13
1997	98	30	20	9	4,080,764	2.40	0.74	0.49	0.22
1998	85	26	17	7	4,155,670	2.05	0.63	0.41	0.17
1999	86	25	17	5	3,546,731	2.42	0.70	0.48	0.14
2000	92	28	23	9	4,299,535	2.14	0.65	0.53	0.21
2001	79	18	20	6	3,297,432	2.40	0.55	0.61	0.18
2002	67	15	18	6	3,151,481	2.13	0.48	0.57	0.19
2003									
2004									
2005									
2006									
2006 goal						0.35	0.10	0.10	0.040
2006 (proj.)						2.52	0.51	0.65	0.211

All accident statistics from NTSB. Flight hour estimates from FAA.

Figure D-1. Part 91 Aviation, Weather-Related Accidents per 100,000 Flight-Hours

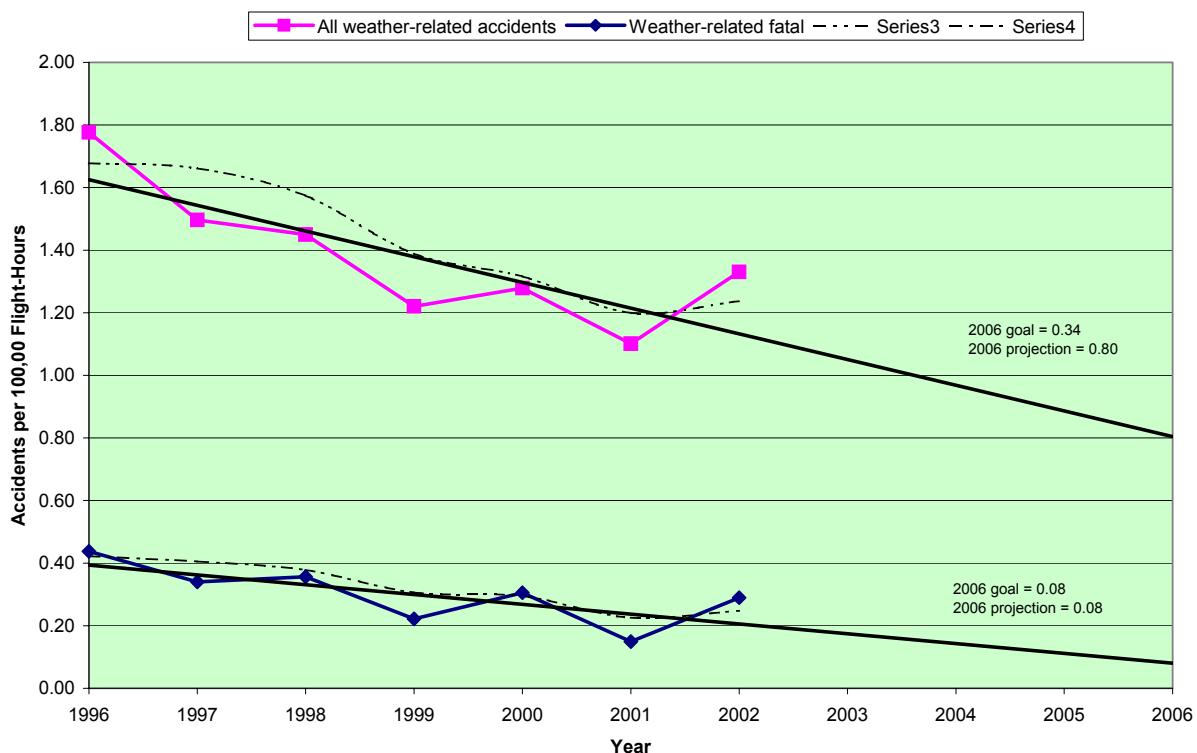


Figure D-2. Part 121 Aviation, Weather-related Accidents per 100,000 Departures

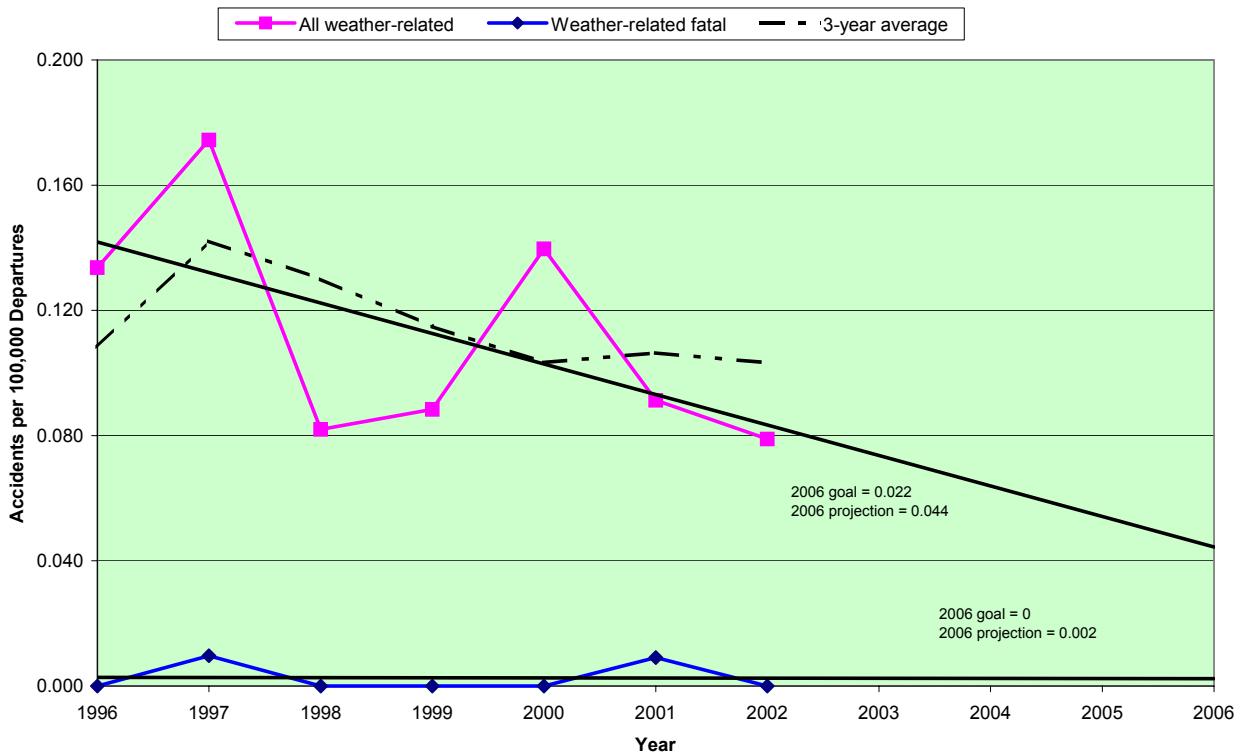


Figure D-3. Part 135 Aviation, Weather-Related Accidents per 100,000 Flight-Hours

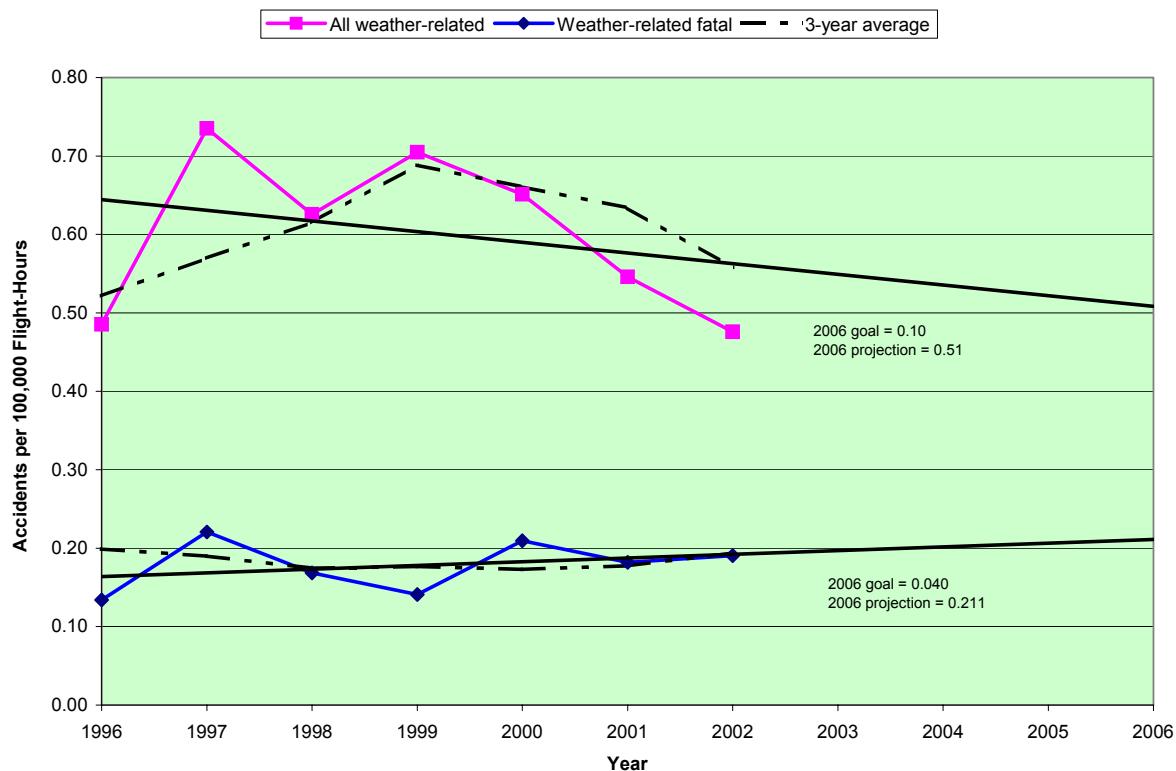


Table D-4. Part 91 (General Aviation) Weather Factor Trend Analysis

Hazard Category and Factors	Factor Citations, All Accidents								Factor Citations, Fatal Accidents							
	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
A. Restricted Visibility and Ceiling Hazards																
Below Approach/Landing Minimums(1)	3	10	3		2	5	1	1		2	4		1	4		1
Clouds (1)	16	16	17	22	16	12	4	15		14	11		16	11	10	3
Fog (1)	45	37	35	29	16	25	16	16		34	30	22	22	9	15	11
Haze/smoke (1)	7	3	6	4	1	2	3	5		3	3	2		1	2	
Low ceiling (1)	59	45	52	41	34	36	19	27		47	34	36	33	23	27	13
Obscuration (1)	8	7	8	12	10	8	3	2		5	5	8	8	8	6	3
Whiteout (1)	2			1	1	1	3	1						1	1	
Total hazard class citations	140	118	121	109	80	89	49	67		105	84	69	81	52	64	32
Frequency per 100,000 flight-hours	0.56	0.47	0.47	0.43	0.27	0.32	0.19	0.26		0.42	0.34	0.27	0.32	0.18	0.23	0.13
2006 goal	0.10									0.08						
2006 projection	0.01									0.00						
B. Precipitation (Non-Icing) Hazards																
Rain (1)	11	7	13	9	9	5	6	4		3	6	9	7	5	2	3
Snow (1)	17	11	9	6	7	17	8	6		13	8	6	5	2	9	4
Drizzle/mist (1)	1	4	1	3	3	3	3	2		1	2	1	2	3	2	2
Total hazard class citations	29	22	23	18	19	25	17	12		17	16	16	14	10	13	9
Frequency per 100,000 flight-hours	0.116	0.088	0.090	0.071	0.065	0.090	0.067	0.047		0.068	0.064	0.063	0.055	0.034	0.047	0.035
2006 goal	0.020									0.013						
2006 projection	0.026									0.005						
C. Icing Hazards																
Icing conditions (5)	25	18	11	9	13	9	3	14		14	11	4	5	6	4	8
Ice Fog (5)								1							1	
Freezing rain (5)	1		1	2		2	1	1		1			2		1	1
Carburetor Icing Conditions (9)	28	17	24	26	18	18	17	17		1	1	4	1		2	1
Total hazard class citations	54	35	36	37	31	29	22	32		16	12	8	8	6	7	2
Frequency per 100,000 flight-hours	0.217	0.141	0.141	0.145	0.106	0.104	0.087	0.125		0.064	0.048	0.031	0.031	0.021	0.025	0.008
2006 goal	0.036									0.011						
2006 projection	0.038									0.000						
D. Turbulence and Convection Hazards																
Turbulence (thunderstorms) (2)	1	5	3	2		1		1		1	4	2	2	1	1	1
Thunderstorm (2)	13	12	3	3	7	5	3	2		8	8	3	2	6	3	2
Thunderstorm (outflow) (2)	3	1	2				1	3		1						2
Microburst/dry (2)	1			1	1		1			0						
Microburst/wet (2)	1									1						

Table D-4. Part 91 (General Aviation) Weather Factor Trend Analysis

Hazard Category and Factors	Factor Citations, All Accidents								Factor Citations, Fatal Accidents							
	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
D. Turbulence and Convection Hazards - Continued																
Updraft (2)				1	1	1	1	1								
Downdraft (2)	30	22	12	16	23	21	11	19	3	2	1	1	2	1	2	1
Gusts (6)	74	105	87	75	74	51	62	77	5	9	9	7	2	3	3	7
Windshear (6)	8	9	1	6	8	9	5	7		1		2		4		
Dust devil/wirlwind (6)	3	5	2	1	9	4	6	3		1						
Variable wind (6)	6	11	5	10	9	9	12	9					1			
Sudden windshift (6)	11	6	8	12	12	6	6	5				1		1		
Mountain wave (7)	2	1	2	3	1	1		2	1	1	2	1	1		1	
Turbulence (7)	13	10	7	9	13	4	3	7	4	3	4	3	4	2	1	1
Turbulence, clear air (CAT)(7)	3	1	2			1		1		1		1				1
Turbulence in clouds (7)		1	1	2	1	2				1		2	1	1		
Turbulence (terrain induced) (7)	6	5	5	6	1	5	1	3	3	3	2	4	1	1	1	
Total hazard class citations	172	196	139	149	160	120	112	140	28	33	23	26	18	17	9	17
Frequency per 100,000 flight-hours	0.691	0.788	0.543	0.584	0.547	0.431	0.440	0.548	0.112	0.133	0.090	0.102	0.062	0.061	0.035	0.067
2006 goal		0.15							0.02							
2006 projection		0.29							0.00							
E. Temperature and Lift Hazards																
Temperature Inversion (3)								1								
High density altitude (6)	25	36	33	37	48	29	15	34	3	9	10	8	9	6	2	11
Temperature, high (6)	3	4	5		1	1	1							1		
Temperature, low (6)	2				1	1		1		1						
Thermal Lift (9)		1	1				3									
No thermal lift (9)	4	4	2	4	5	2	2	3		1			1			
Total hazard class citations	34	45	41	41	55	33	22	38	4	10	10	8	9	8	2	11
Frequency per 100,000 flight-hours	0.137	0.181	0.160	0.161	0.188	0.119	0.087	0.149	0.016	0.040	0.039	0.031	0.031	0.029	0.008	0.043
2006 goal		0.032							0.006							
2006 projection		0.104							0.029							
F. En Route and Terminal Winds																
Unfavorable wind (3)	20	14	17	7	6	7	1	6	2	2	1					
Crosswind (6)	90	123	111	87	78	80	77	71	5	7		1	1			2
Tailwind (6)	50	36	36	46	46	52	41	45	6	7	2	6	2	7	3	5
High wind (6)	18	36	17	19	12	14	20	12	2	7	5	2	1	3	2	3
Total hazard class citations	178	209	181	159	142	153	139	134	15	23	8	9	4	10	5	10
Frequency per 100,000 flight-hours	0.71	0.84	0.71	0.62	0.49	0.55	0.55	0.52	0.060	0.092	0.031	0.035	0.014	0.036	0.020	0.039
2006 goal		0.16							0.015							
2006 projection		0.32							0.000							

Table D-4. Part 91 (General Aviation) Weather Factor Trend Analysis

Figure D-4. Part 91, Trend for Category A, Restricted Visibility and Ceiling Hazards

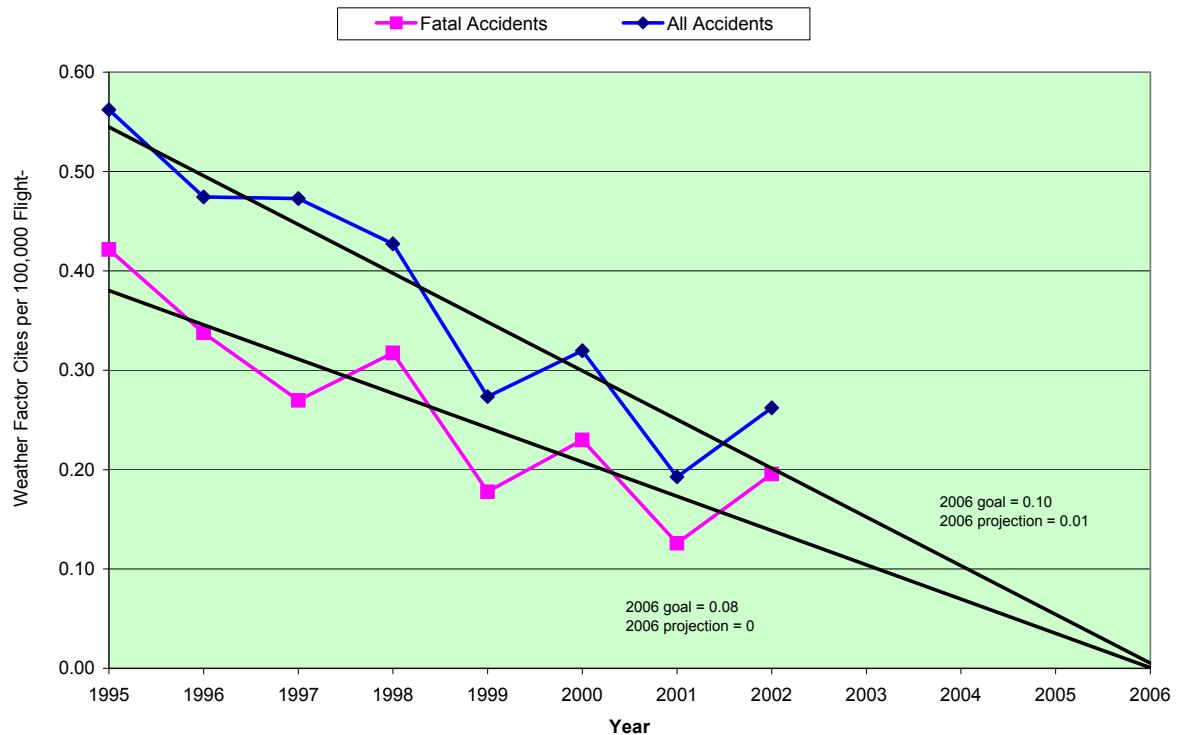


Figure D-5. Part 91, Trend for Category B, Precipitation (Non-Icing) Hazards

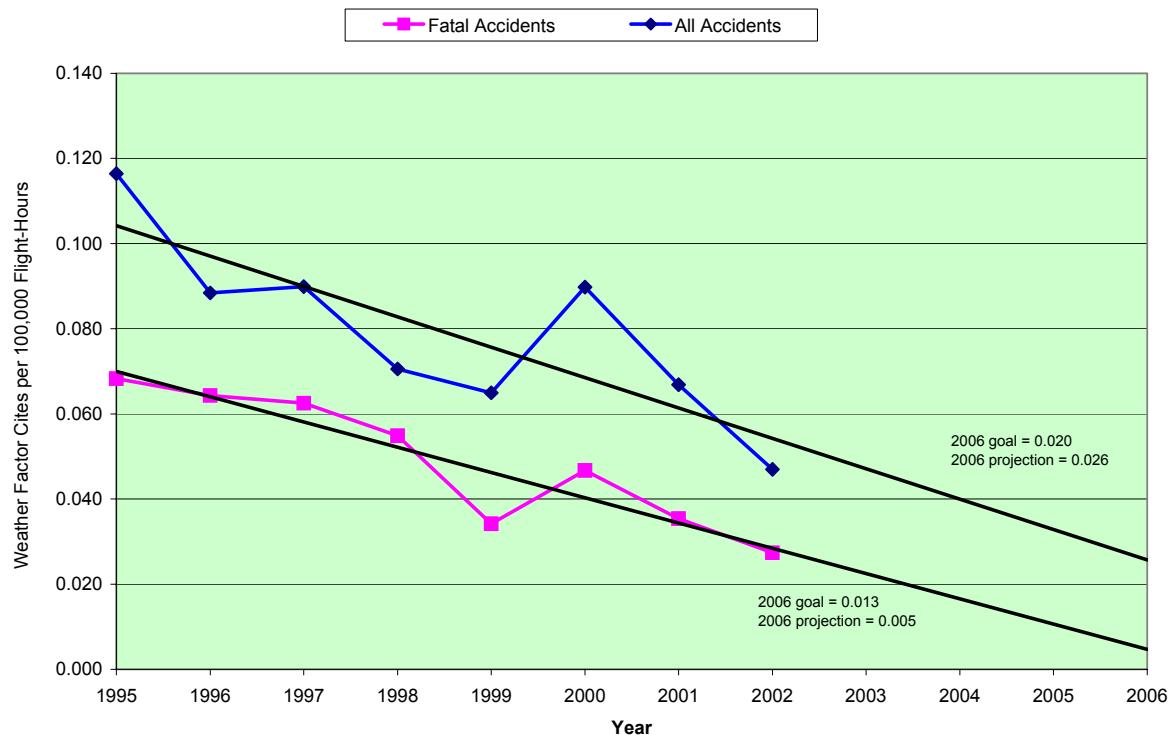


Figure D-6. Part 91, Trend for Category C, Icing Hazards

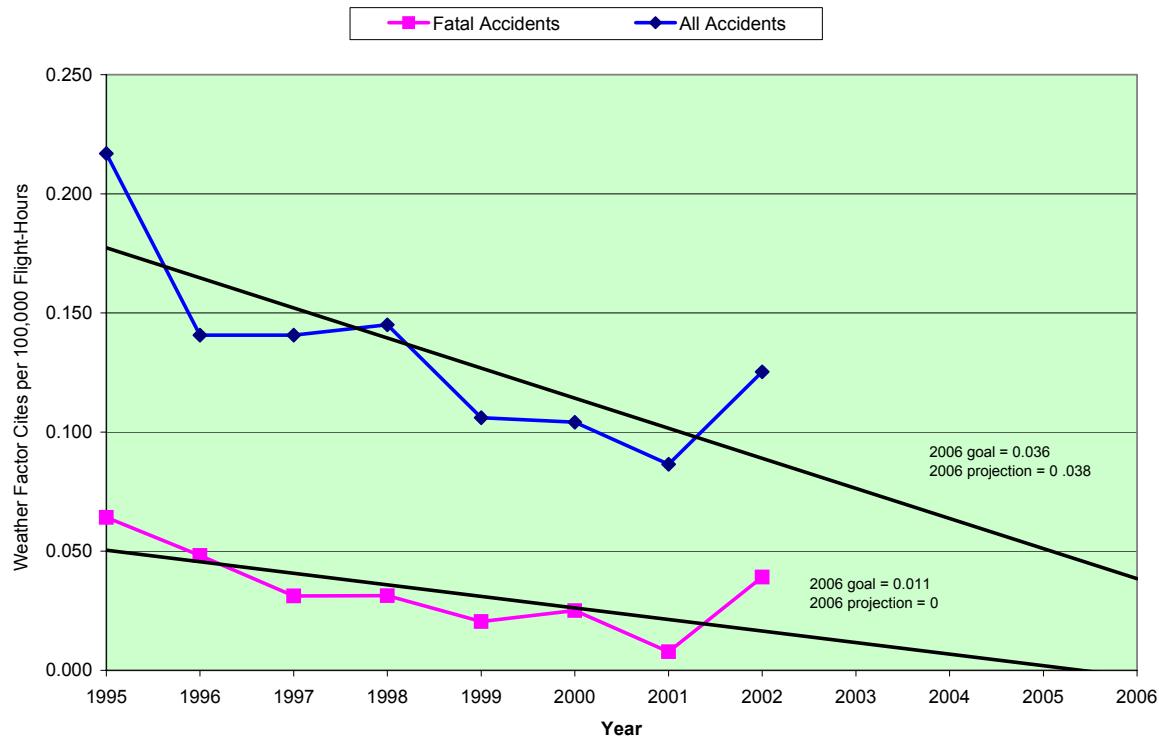


Figure D-7. Part 91, Trend for Category D, Turbulence and Convection Hazards

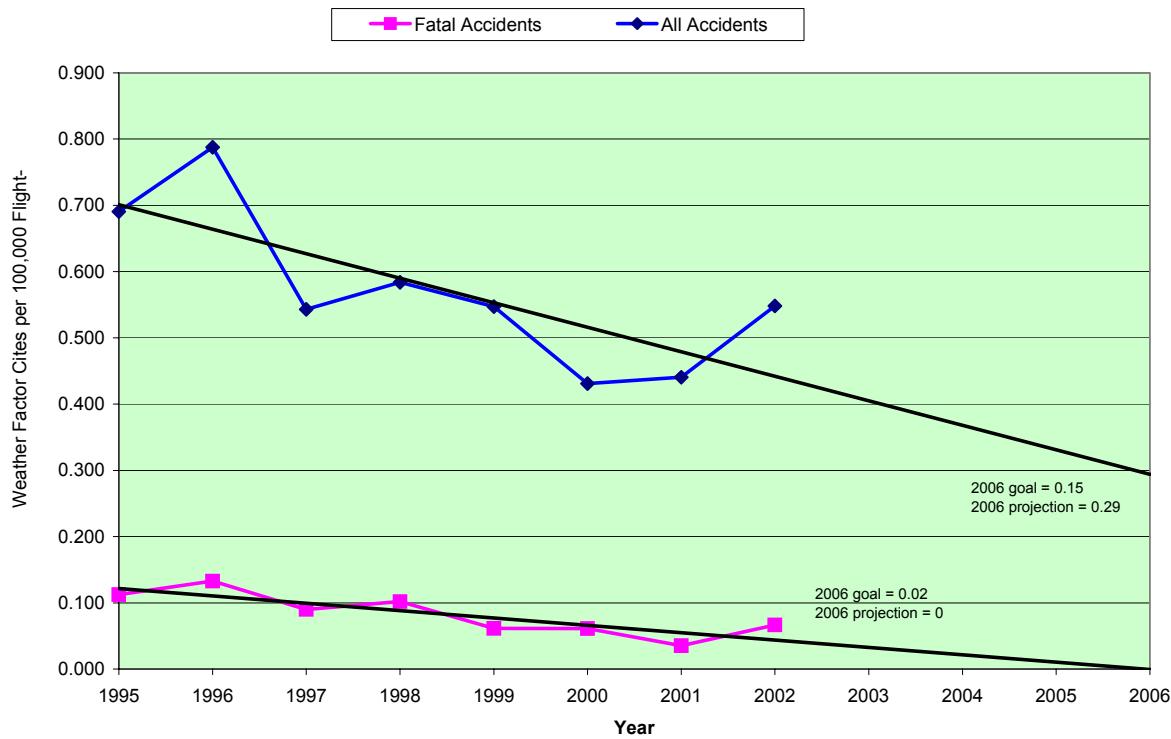


Figure D-8. Part 91, Trend for Category E, Temperature and Lift Hazards

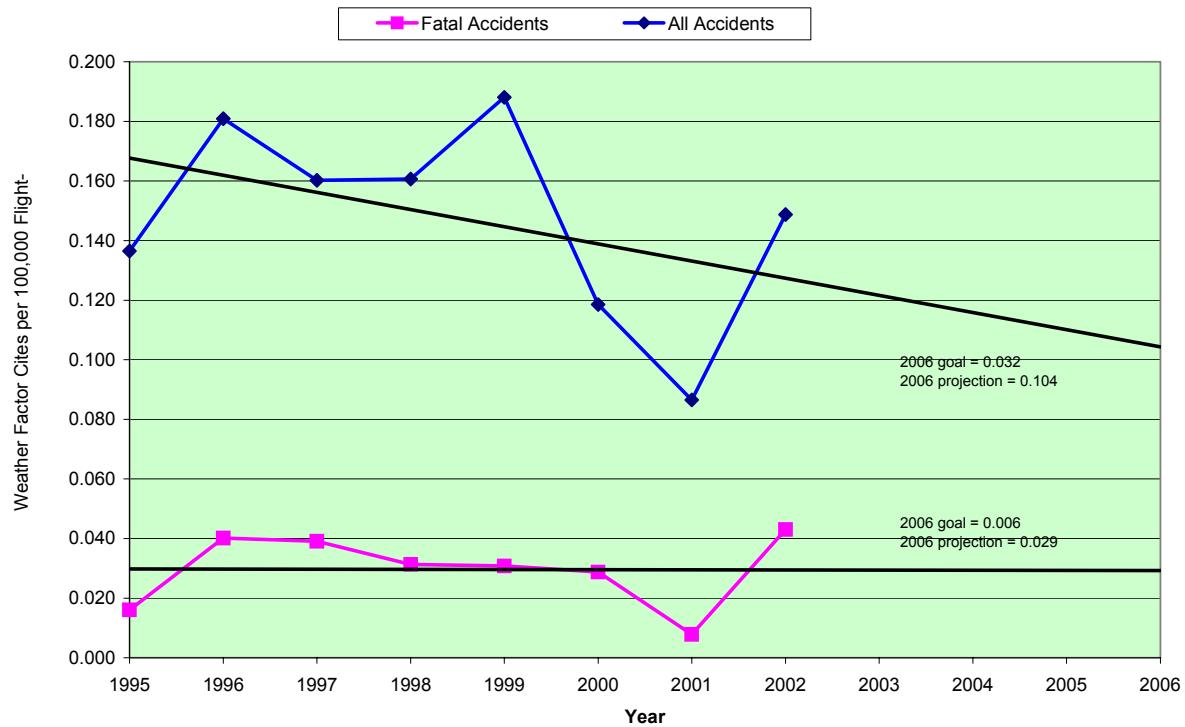


Figure D-9. Part 91, Trend for Category F, En Route and Terminal Winds

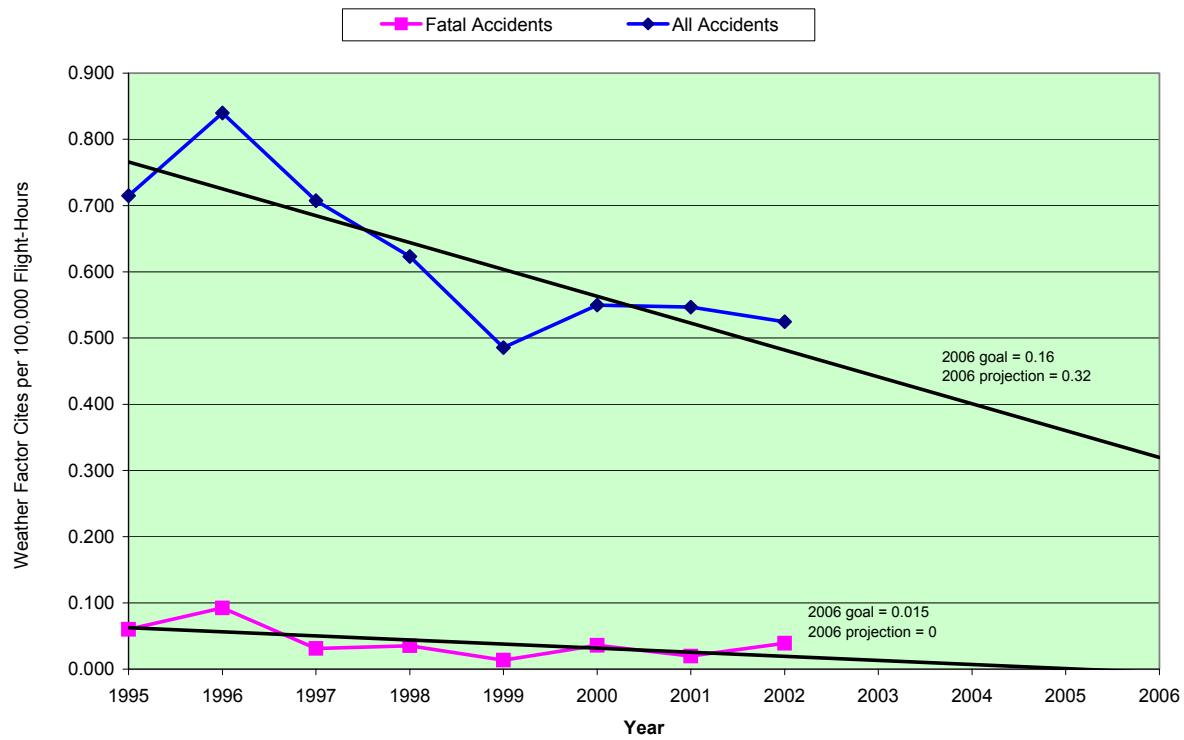


Table D-5. Part 121 Weather Factor Trend Analysis

Table D-5. Part 121 Weather Factor Trend Analysis

Table D-6. Part 135 Weather Factor Trend Analysis

	Factor Citations, All Accidents								Factor Citations, All Accidents							
	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
A. Restricted Visibility and Ceiling Hazards																
Below Approach/Landing Minimums(1)								1								
Clouds (1)	2	1	3	2	2	2	2		2	1	3	2	1	1	1	
Fog (1)	5	9	6	3	1	3	1	2	3	2	2	2	1	2	1	
Low ceiling (1)	7	10	9	6	5	7	3	3	6	5	4	1	2	5	3	3
Obscuration (1)	2	2	2					2	2	1						1
Whiteout (1)	1	3	2	3	4	3	1	1		1		1	1	1	1	
Total hazard class citations	17	25	22	14	10	15	8	8	13	9	10	5	4	9	5	5
Frequency per 100,000 flight-hours	0.33	0.42	0.54	0.34	0.28	0.35	0.24	0.25	0.25	0.15	0.25	0.12	0.11	0.21	0.15	0.16
2006 goal	0.075								0.04							
2006 projection	0.16								0.11							
B. Precipitation (Non-Icing) Hazards																
Rain (1)	2		1	2		1	2		1			1		1	1	
Snow (1)	2	2	2	2	3	4	1	3	1			2	1	1	1	0
Drizzle/mist (1)	1	1						1		1					1	
Total hazard class citations	5	3	3	4	3	5	3	4	2	1	0	3	1	2	1	1
Frequency per 100,000 flight-hours	0.10	0.05	0.07	0.10	0.08	0.12	0.09	0.13	0.04	0.02	0.00	0.07	0.03	0.05	0.03	0.03
2006 goal	0.015								0.006							
2006 projection	0.14								0.04							
C. Icing Hazards																
Icing conditions (5)	4	3	4	4	3	3	2	4	1	1	2	2	1	2	2	1
Freezing rain (5)	1				1	1		1								1
Carburetor Icing Conditions (9)			1			2										
Total hazard class citations	5	3	5	4	4	6	2	5	1	1	2	2	1	2	2	2
Frequency per 100,000 flight-hours	0.10	0.05	0.12	0.10	0.11	0.14	0.06	0.16	0.02	0.02	0.05	0.05	0.03	0.05	0.06	0.06
2006 goal	0.015								0.004							
2006 projection	0.15								0.09							

Table D-6. Part 135 Weather Factor Trend Analysis

	Factor Citations, All Accidents								Factor Citations, All Accidents							
	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
D. Turbulence and Convection Hazards																
Turbulence (thunderstorms) (2)						1								1		
Thunderstorm (2)					1											
Downdraft (2)	2	1	5	2	3				1		1		1			
Gusts (6)	4	3	2	3	2				2	1			1			
Windshear								1								1
Variable wind (6)	1	1						1								
Turbulence (7)					1	1	1									
Turbulence in clouds (7)	1											1				
Turbulence (terrain induced) (7)	1		2			1	1				1		1			
Total hazard class citations	9	5	9	6	6	3	5	3	3	1	2	0	0	1	0	1
Frequency per 100,000 flight-hours	0.18	0.08	0.22	0.14	0.17	0.07	0.15	0.10	0.06	0.02	0.05	0.00	0.00	0.02	0.00	0.03
2006 goal		0.026							0.008							
2006 projection		0.08							0.00							
E. Temperature and Lift Hazards																
High density altitude (6)	1		2	3	1	3			1			1				
Temperature, low (6)				1							1					
Total hazard class citations	1	0	2	4	1	3	0	0	1	0	0	1	1	0	0	0
Frequency per 100,000 flight-hours	0.02	0.00	0.05	0.10	0.03	0.07	0.00	0.00	0.02	0.00	0.00	0.02	0.03	0.00	0.00	0.00
2006 goal		0.002							0.002							
2006 projection		0.02							0.00							
F. En Route and Terminal Winds																
Unfavorable wind (3)	1	1	1		1	2										
Crosswind (6)		5	4	5	1	3	3	1								1
High wind (6)	2	1	2	1	1		1	1		1	1	1	1			1
Tailwind (6)		4	4	3	4	2	1	4				1	1			
Total hazard class citations	3	11	11	9	7	7	5	6	1	2	1	1	0	0	0	2

Table D-6. Part 135 Weather Factor Trend Analysis

	Factor Citations, All Accidents								Factor Citations, All Accidents							
	1995	1996	1997	1998	1999	2000	2001	2002	1995	1996	1997	1998	1999	2000	2001	2002
F. En Route and Terminal Winds-Continued																
Frequency per 100,000 flight-hours	0.06	0.18	0.27	0.22	0.20	0.16	0.15	0.19	0.02	0.03	0.02	0.02	0.00	0.00	0.00	0.06
2006 goal		0.024							0.005							
2006 projection		0.22							0.024							
G. Electrical Hazards																
Lightning (2)		1														
Total hazard class citations	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frequency per 100,000 flight-hours	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2006 goal		0.002							0.000							
2006 projection		0.00							0.000							

Figure D-10. Part 121, All Weather Hazards Versus Turbulence and Convection Hazards

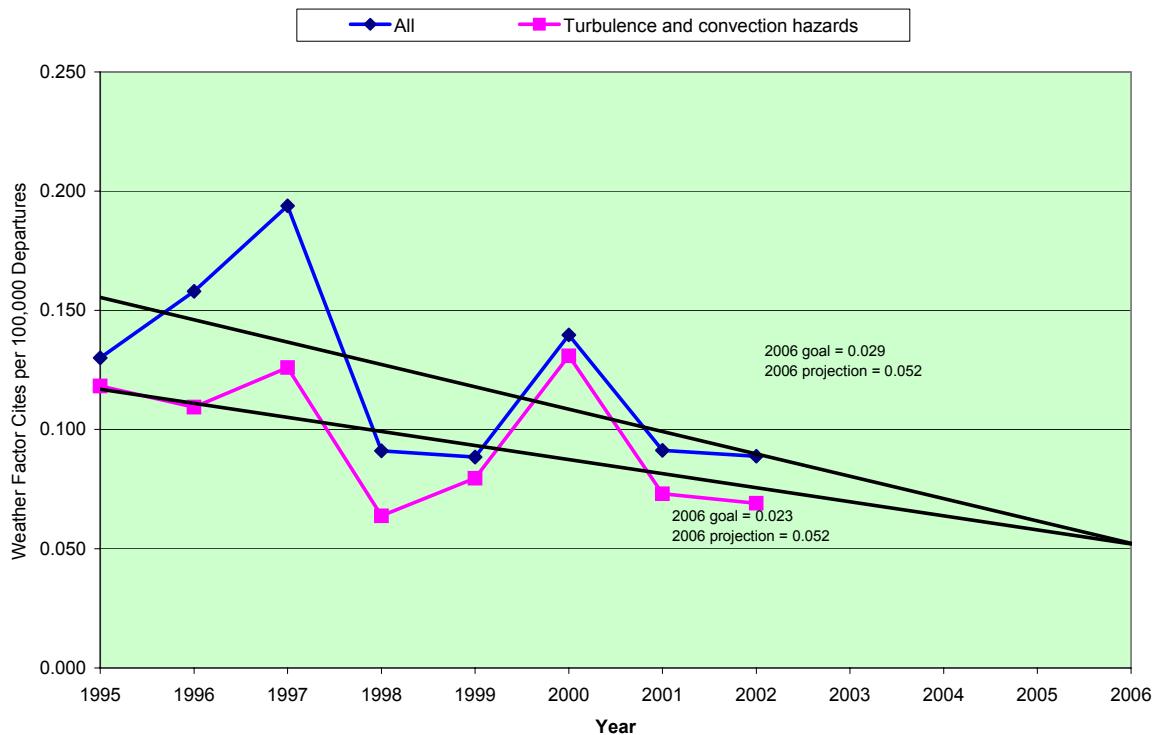


Figure D-11. Part 135, Trend for Category A, Restricted Visibility and Ceiling Hazards

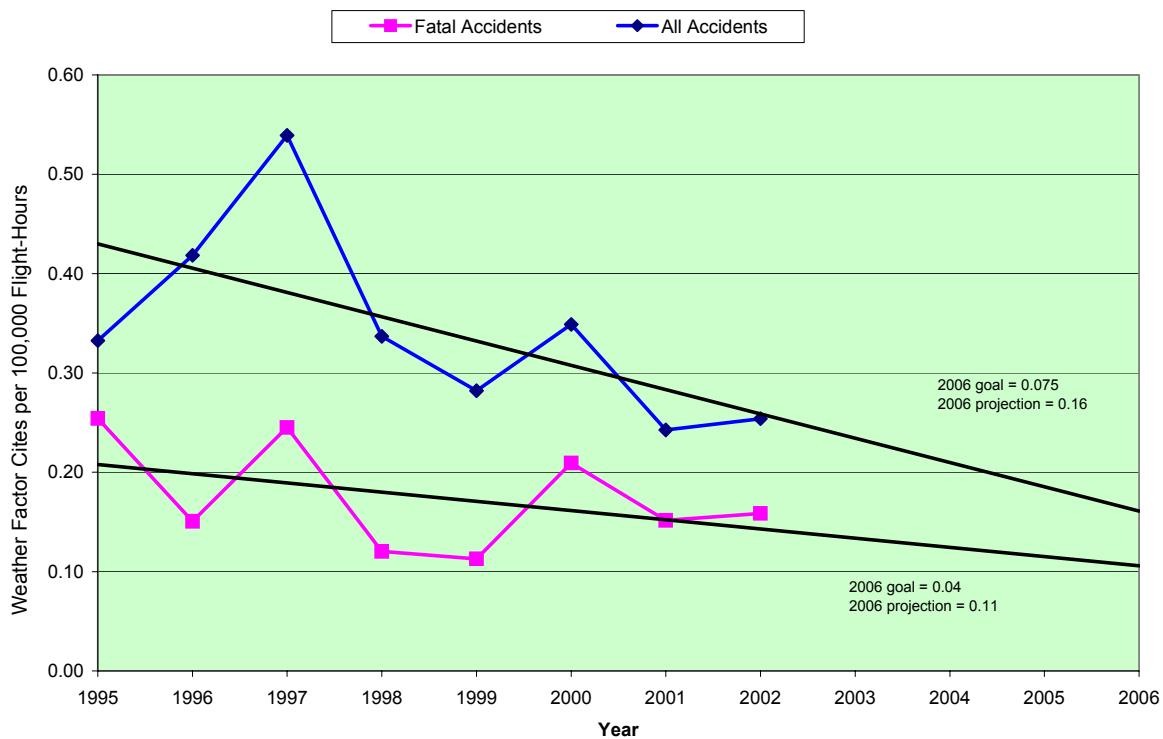


Figure D-12. Part 135, Trend for Category B, Precipitation (Non-Icing) Hazards

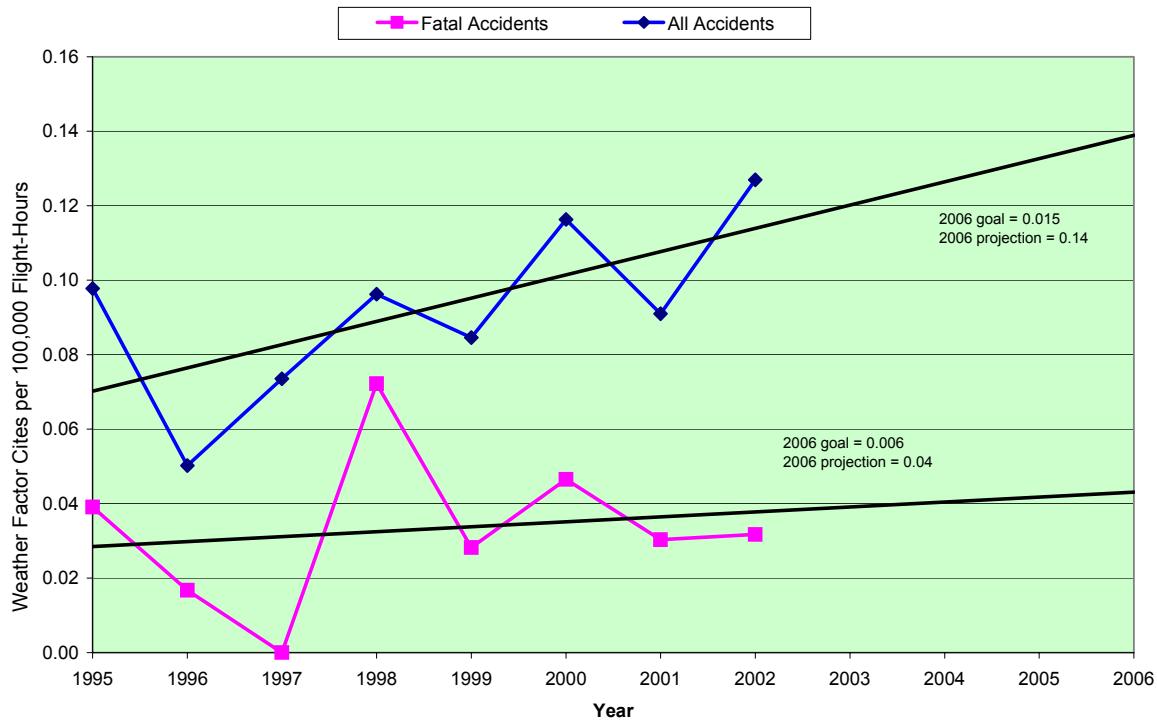


Figure D-13. Part 135, Trend for Category C, Icing Hazards

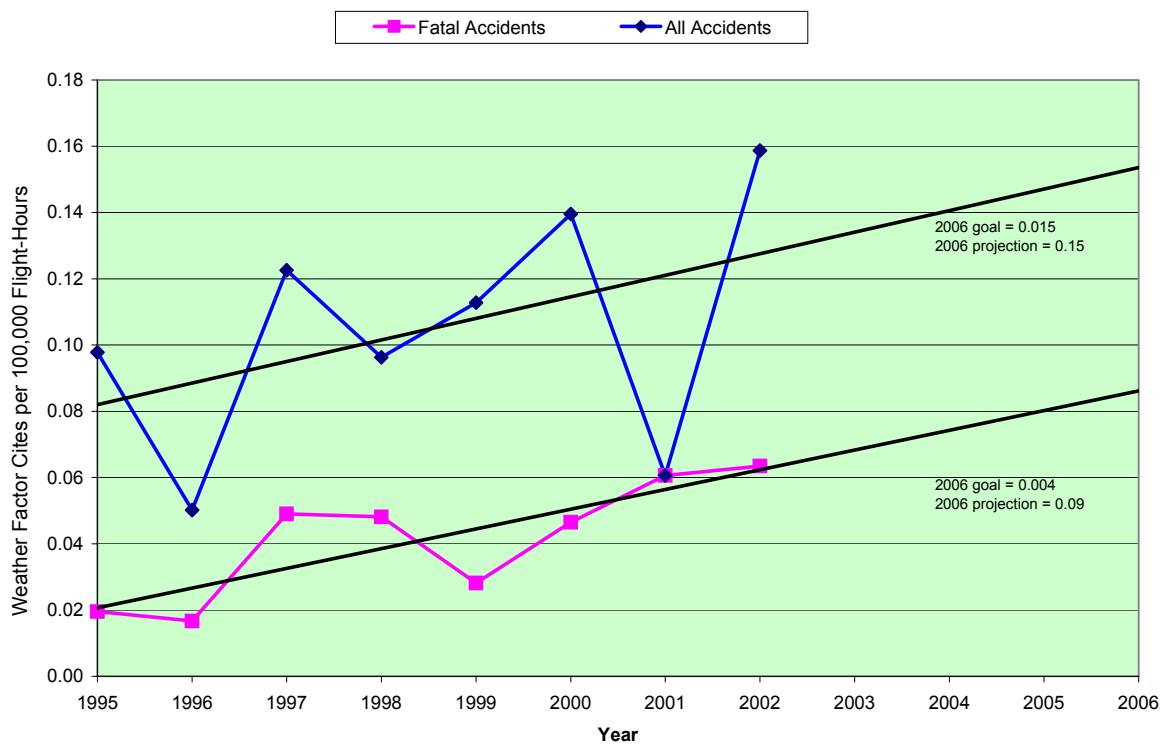


Figure D-14. Part 135, Trend for Category D, Turbulence & Convection Hazards

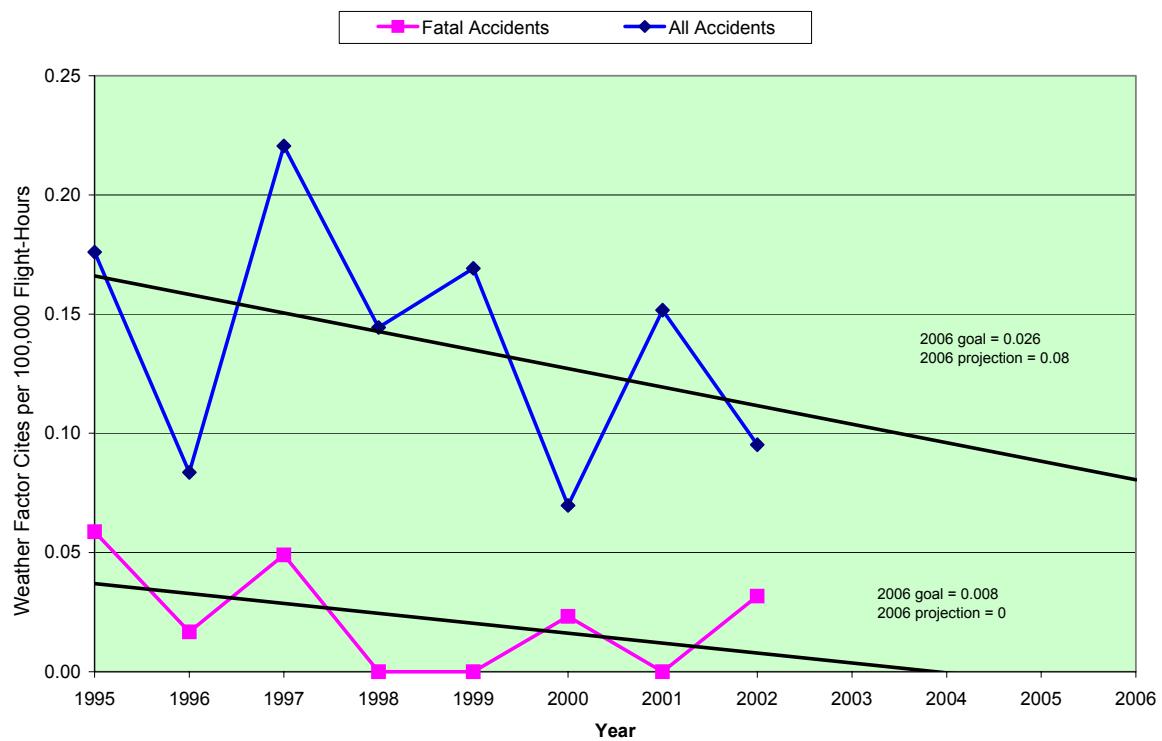


Figure D-15. Part 135, Trend for Category E, Temperature and Lift Hazards

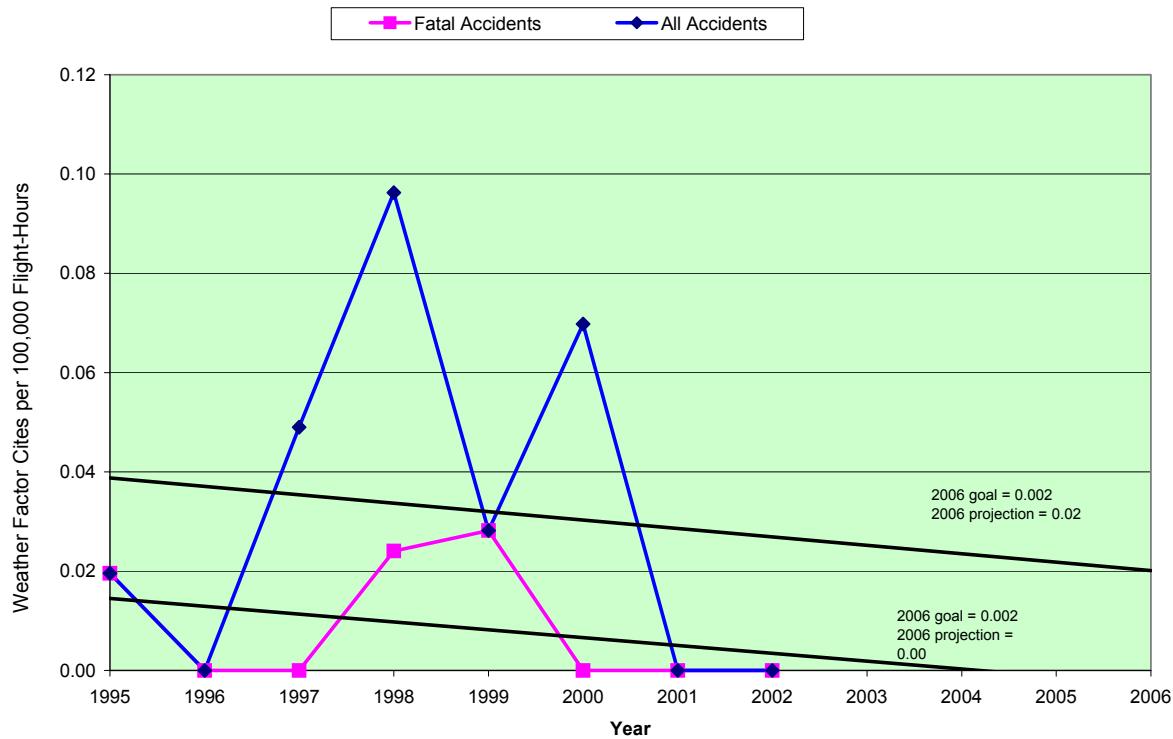


Figure D-16. Part 135, Trend for Category F, En Route and Terminal Winds

